Space Weather Technical Forecast

Issued on Saturday, 20 January 2024 at 01:09 Local

This technical forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

Space Weather Forecast Headline: Chance of isolated M-class flares.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Low with only a few minor C-class flares observed. There are currently ten sunspot regions on the visible disc with the most notable AR3559 in the northeast. This is the largest region on the disc, with a number of intermediate spots becoming evident as this moves into a less oblique viewing angle, however this maintains a simple bipolar structure. AR3561, which rapidly grew early on 19 Jan is currently a small and simple region but with some ongoing, slow development. However, this is also of note due to its proximity to another simple bipolar group AR3555, both in the southeast disc. The other regions are either small, or mature stable spots.

No Earth-directed CMEs were observed in available imagery, with the CME from the slow filament lifting off the north of the disc passing well above Earth.

Solar Wind / Geomagnetic Activity: Solar winds, as observed at L1 by ACE and DSCOVR, eased from slightly elevated levels to near background, likely due to the declining influence of CH92/+. Speeds eased from around 450km/s to just over 400 km/s. Interplanetary magnetic field (IMF), Bt, eased from peak Moderate values of 7-9nT to be weak, below 6nT, from 19/1200 UTC. The north-south component, Bz, was mainly Weak, ranging between -7nT and +6nT. Phi angle was predominantly positive (away from the Sun). Geomagnetic activity was Quiet to Unsettled (Kp 1-3).

Energetic Particles / Solar Radiation: GOES18 high energy (greater than 10MeV) proton flux was at background. GOES16 high energy (greater than 2MeV) electron flux was at background. The associated 24-hour fluence was well below Active (1e8 integrated pfu) on a steady trend. The 20/0000 UTC 24-hour integrated fluence observation was 1.13e6 integrated pfu.

Four-Day Space Weather Forecast Summary

Solar Activity: Mainly Low activity is expected to continue, with a chance of isolated M-class flares.

Solar Wind / Geomagnetic Activity: There are no Earth directed CMEs. The next fast wind enhancement is likely to be from CH93 later day 1 or early day 2 (20-21 Jan), with slightly elevated solar winds expected. Geomagnetic activity is expected to be mainly Quiet, but likely increasing to give a spell of Unsettled with a chance of isolated Active intervals later day 1 or day 2 due to the fast wind onset.

Energetic Particles / Solar Radiation: High energy proton flux is forecast to remain at background. The high energy electron flux is also expected to persist at background, with only a chance of rising to Moderate later in the period as a result of any solar wind enhancement from CH93 fast wind. The associated 24 hour fluence is expected to persist below the Active threshold.

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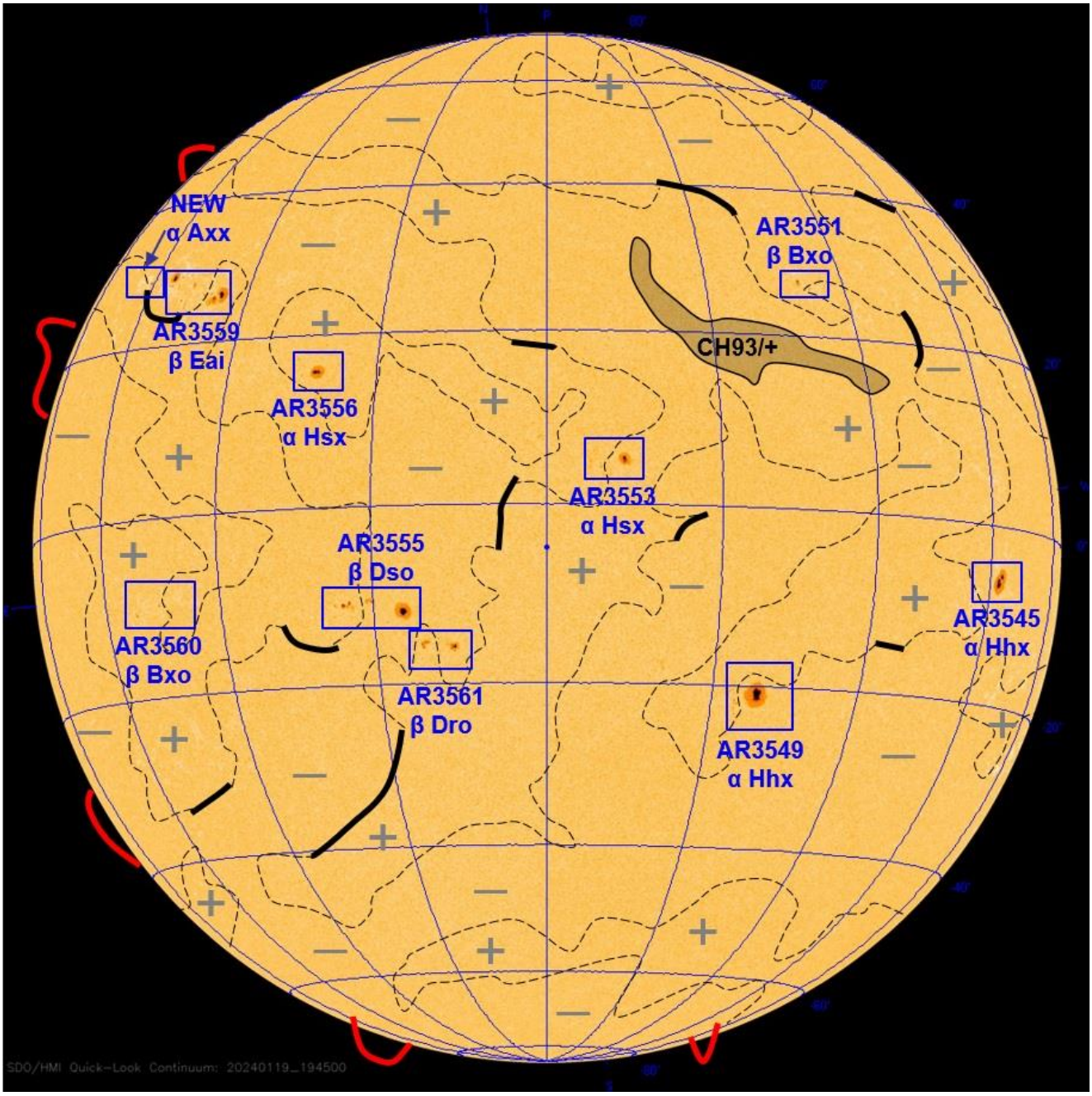
Figure 1. Solar Analysis Valid 19/2000 UTC.



Key: Filament ___ , Prominence ___ , Magnetic Field Line - - - , Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α-β-βγ-βγδ and Zurich-McIntosh Axx etc.

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Geomagnetic Storms:

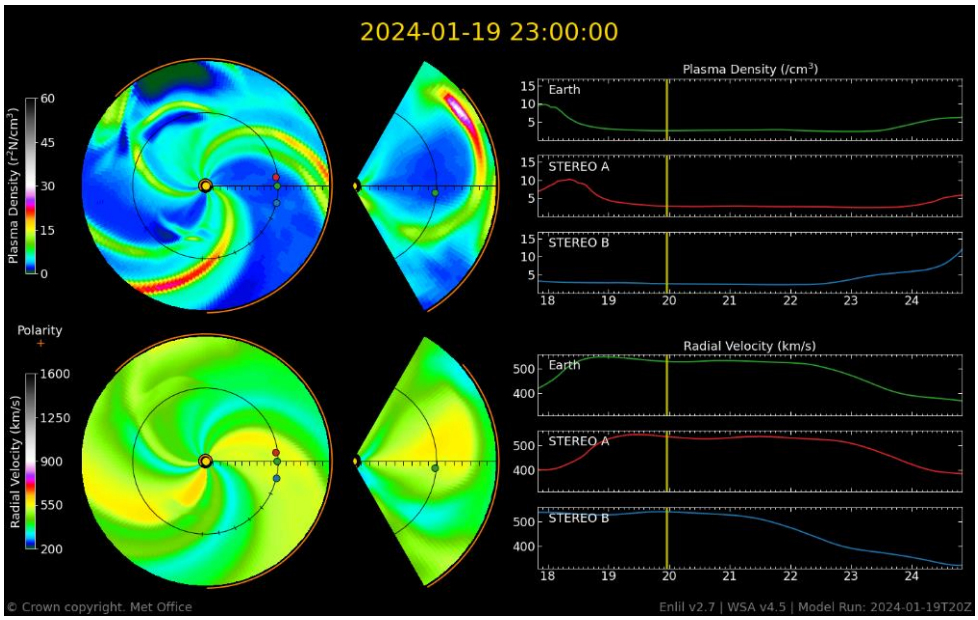
There are no Earth-directed CMEs.

A very weak solar wind enhancement is possible later day 1 or day 2 (Jan 20-21) due to the onset of any fast winds from CH93/+. Slightly elevated winds are expected, peaking 450-500km/s, however geomagnetic activity is expected to remain muted. This is due to this feature being of positive polarity and located in the northern hemisphere located, both of which suggests an unfavourable situation for a notable connection at this time of year. This feature also only produced a weak enhancement last rotation. The main uncertainty is that MOSWOC Enlil has a persistent enhancement to around 500km/s, however this is currently not expected.

Overall geomagnetic activity is expected to be mainly Quiet, but likely increasing to give a spell of Unsettled with a chance of isolated Active intervals later day 1 or day 2 (20-21 Jan) due to the fast wind onset.

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	5	5	1	1
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Figure 2: Enlil currently over-estimating expected enhancement.



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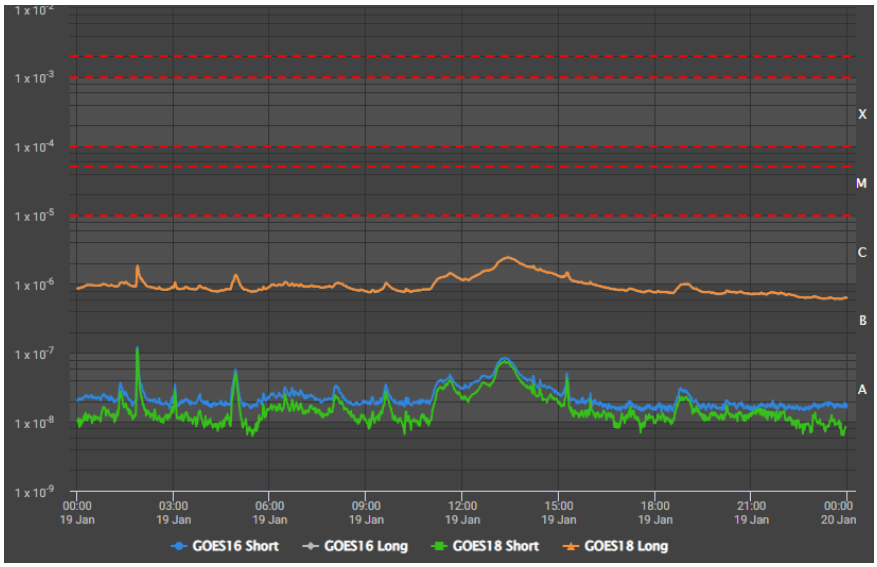
Radio Blackouts - X-Ray Flares:

Low activity is forecast with only a slight chance of isolated M-class flares.

There are ten sunspot on visible disc, however all are relatively simple and either small or mature unipolar regions. The most notable and largest region is AR3559 in the northeast which has shown an increase in spot number as it moves to a less oblique angle, although it is unclear if this is due to any ongoing flux emergence. Some slight growth also continues in small spot AR3561, which rapidly developed early on 19 Jan, but now maintains a simple bipolar structure.

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	No	30	30	35	40
Very Active	R3 to R5 X Class	No	1	1	1	1

Figure 3: GOES 16/18 X-ray flux



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Solar Radiation Storms - (High Energy Protons):

GOES18 high energy (greater than 10MeV) proton flux is currently at back, with only a very slight chance of rising and reaching the S1 Minor Radiation Storm threshold in response to any notable flares.

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ S1**	No	2	2	2	2
Very Active	**≥ S3 ***	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

High Energy Electrons Event (≥ 2MeV):

The high energy electron flux as observed by GOES16 is expected to be at predominantly background levels through the period. Recent very weak enhancement from the fast wind of CH92/+ and any subsequent weak enhancement from the fast wind of CH93/+ will result in a chance of reaching Moderate at diurnal maximum, mainly later in the period.

Associated 24 hour fluence is forecast to remain below the Active threshold through the period. This is supported by REFM, with only a very slight increase signaled due to the recent slightly elevated winds from CH92/+

GEO Electron Environment Probability (Exceedance)	Level (cm^{-2} sr^{-1} day^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ 2 MeV ≥ $1x10^8$**	No	1	1	1	1
Very Active	**≥ 2 MeV ≥ $1x10^9$**	No	1	1	1	1

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